WHAT IS CLAIMED IS:

1. An image processing apparatus for processing electronic image data obtained by image pickup operation via an optical system, the image data having two-dimensionally-arranged pixel data in the row direction and the column direction, the image processing apparatus comprising:

a memory that stores the image data at least before image processing and further stores the image data after the image procession;

a first data-order converting unit that reads the pixel data in units of a block of the two-dimensional arrangement of the image data via a bus from the memory and thereafter outputs the pixel data in the block in the column direction;

an image processing unit that is connected to the first data-order converting unit so that a pipeline processing can be performed via an information sending channel different from the bus, inputs the image data outputted in the column direction from the first data-order converting unit, performs the image processing, and thereafter outputs the image data in the column direction; and

a second data-order converting unit that is connected to the image processing unit so that a pipeline processing can be performed, converts the image data outputted in the column direction from the image processing unit into the

image data in the row correction, and outputs the converted image data.

2. The image processing apparatus according to Claim 1, wherein the first data-order converting unit can change the size at least one of the image data in the row direction and the image data in the column direction read from the memory in units of a block.

3. The image processing apparatus according to Claim 1, wherein the image data before the image procession is any of the following; image pickup data that is obtained by photoelectrically converting, by image pickup means, a subject optical image formed by the optical system and outputted; non-compressed image data that is the image pickup data subjected, as occasion demands, to predetermined processing, excluding compressing processing; and compressed image data that is obtained by compressing processing after performing predetermined processing on the image pickup data, excluding the compressing processing, as occasion demands.

4. The image processing apparatus according to Claim 2, wherein the image data before the image procession is any of the following; the image pickup data that is obtained by photoelectrically converting, by image pickup means, a

subject optical image formed by the optical system and outputted; non-compressed image data that is the image pickup data subjected, as occasion demands, to predetermined processing, excluding compressing processing; and compressed image data that is obtained by compressing processing after performing predetermined processing on the image pickup data, excluding the compressing processing, as occasion demands.

5. The image processing apparatus according to Claim 1, wherein the image processing unit comprises a distortion correction processing unit that corrects the distortion aberration due to the optical system.

6. The image processing apparatus according to Claim 4, wherein the image processing unit comprises a distortion correction processing unit that corrects the distortion aberration due to the optical system.

7. The image processing apparatus according to Claim 5, wherein the distortion correction processing unit comprises:

an interpolating-coordinate generating unit that generates interpolating coordinates;

an inner memory unit that partly stores the image data; and

an interpolation calculating unit that generates pixel

data of interpolating coordinates from image data stored in the inner memory unit based on the interpolating coordinates generated by the interpolating-coordinate generating unit.

8. The image processing apparatus according to Claim 6, wherein the distortion correction processing unit comprises:

an interpolating-coordinate generating unit that generates interpolating coordinates;

an inner memory unit that partly stores the image data; and

an interpolation calculating unit that generates pixel data of interpolating coordinates from image data stored in the inner memory unit based on the interpolating coordinates generated by the interpolating-coordinate generating unit.

9. The image processing apparatus according to Claim 7, wherein the interpolating-coordinate generating unit comprises:

an interpolating-position generating unit that generates coordinates of a pixel of an interpolating target in the image after correction of the distortion; and

a distortion-correcting-coordinate converting unit that obtains coordinates in the image before correction of the distortion, corresponding to the coordinates generated by the interpolating-position generating unit.

10. The image processing apparatus according to Claim 8, wherein the interpolating-coordinate generating unit comprises:

an interpolating-position generating unit that generates coordinates of the pixel of an interpolating target, in the image after correction of the distortion; and

a distortion-correcting-coordinate converting unit that obtains coordinates in the image before correction of the distortion, corresponding to the coordinates generated by the interpolating-position generating unit.

11. The image processing apparatus according to Claim 9, wherein the interpolating-coordinate generating unit further comprises a selector that selects either of the coordinates generated by the interpolating-position generating unit or the coordinates obtained by the distortion-correcting-coordinate converting unit, and outputs the selected coordinates to the interpolation calculating unit.

12. The image processing apparatus according to Claim 10, wherein the interpolating-coordinate generating unit further comprises a selector that selects either of the coordinates generated by the interpolating-position

generating unit or the coordinates obtained by the distortion-correcting-coordinate converting unit, and outputs the selected coordinates to the interpolation calculating unit.

13. The image processing apparatus according to Claim 9, wherein the distortion-correcting-coordinate converting unit obtains coordinates in the image before correcting the distortion, corresponding to the coordinates generated by the interpolating-position generating unit, by using a predetermined correcting formula including a polynomial obtained by linearly combining the integer power of the distance from the center of distortion to the interpolating position.

14. The image processing apparatus according to Claim 10, wherein the distortion-correcting-coordinate converting unit obtains coordinates in the image before correcting the distortion, corresponding to the coordinates generated by the interpolating-position generating unit, by using a predetermined correcting formula including a polynomial obtained by linearly combining the integer power of the distance from the center of distortion to the interpolating position.

15. The image processing apparatus according to Claim 11, wherein the distortion-correcting-coordinate converting unit obtains coordinates in the image before correcting the distortion, corresponding to the coordinates generated by the interpolating-position generating unit, by using a predetermined correcting formula including a polynomial obtained by linearly combining the integer power of the distance from the center of distortion to the interpolating position.

16. The image processing apparatus according to Claim 12, wherein the distortion-correcting-coordinate converting unit obtains coordinates in the image before correcting the distortion, corresponding to the coordinates generated by the interpolating-position generating unit, by using a predetermined correcting formula including a polynomial obtained by linearly combining the integer power of the distance from the center of distortion to the interpolating position.

17. The image processing apparatus according to Claim 13, wherein the polynomial includes a term of a high degree of the distance, which is higher than the second degree.

18. The image processing apparatus according to Claim

14, wherein the polynomial includes a term of a high degree of the distance, which is higher than the second degree.

19. The image processing apparatus according to Claim 15, wherein the polynomial includes a term of a high degree of the distance, which is higher than the second degree.

20. The image processing apparatus according to Claim 16, wherein the polynomial includes a term of a high degree of the distance, which is higher than the second degree.

21. The image processing apparatus according to Claim 13, wherein the image processing unit further comprises another image processing unit other than the distortion correction processing unit, and

the distortion-correcting-coordinate converting unit outputs, to the other image processing unit, information on the distance from the center of distortion to the interpolating position.

22. The image processing apparatus according to Claim 14, wherein the image processing unit further comprises another image processing unit other than the distortion correction processing unit, and

the distortion-correcting-coordinate converting unit

outputs, to the other image processing unit, information on the distance from the center of distortion to the interpolating position.

23. The image processing apparatus according to Claim 15, wherein the image processing unit further comprises another image processing unit other than the distortion correction processing unit, and

the distortion-correcting-coordinate converting unit outputs, to the other image processing unit, information on the distance from the center of distortion to the interpolating position.

24. The image processing apparatus according to Claim 16, wherein the image processing unit further comprises another image processing unit other than the distortion correction processing unit, and

the distortion-correcting-coordinate converting unit outputs, to the other image processing unit, information on the distance from the center of distortion to the interpolating position.

25. The image processing apparatus according to Claim 17, wherein the image processing unit further comprises another image processing unit other than the distortion

correction processing unit, and

the distortion-correcting-coordinate converting unit outputs, to the other image processing unit, information on the distance from the center of distortion to the interpolating position.

26. The image processing apparatus according to Claim 18, wherein the image processing unit further comprises another image processing unit other than the distortion correction processing unit, and

the distortion-correcting-coordinate converting unit outputs, to the other image processing unit, information on the distance from the center of distortion to the interpolating position.

27. The image processing apparatus according to Claim 19, wherein the image processing unit further comprises another image processing unit other than the distortion correction processing unit, and

the distortion-correcting-coordinate converting unit outputs, to the other image processing unit, information on the distance from the center of distortion to the interpolating position.

28. The image processing apparatus according to Claim

20, wherein the image processing unit further comprises another image processing unit other than the distortion correction processing unit, and

the distortion-correcting-coordinate converting unit outputs, to the other image processing unit, information on the distance from the center of distortion to the interpolating position.

29. The image processing apparatus according to Claim 21, wherein the above-described another image processing unit comprises at least one of a shading correcting unit, a low-pass filter processing unit, and an edge-emphasis processing unit.

30. The image processing apparatus according to Claim 22, wherein the above-described another image processing unit comprises at least one of a shading correcting unit, a low-pass filter processing unit, and an edge-emphasis processing unit.

31. The image processing apparatus according to Claim 23, wherein the above-described another image processing unit comprises at least one of a shading correcting unit, a low-pass filter processing unit, and an edge-emphasis processing unit.

32. The image processing apparatus according to Claim 24, wherein the above-described another image processing unit comprises at least one of a shading correcting unit, a low-pass filter processing unit, and an edge-emphasis processing unit.

33. The image processing apparatus according to Claim 25, wherein the above-described another image processing unit comprises at least one of a shading correcting unit, a low-pass filter processing unit, and an edge-emphasis processing unit.

34. The image processing apparatus according to Claim 26, wherein the above-described another image processing unit comprises at least one of a shading correcting unit, a low-pass filter processing unit, and an edge-emphasis processing unit.

35. The image processing apparatus according to Claim 27, wherein the above-described another image processing unit comprises at least one of a shading correcting unit, a low-pass filter processing unit, and an edge-emphasis processing unit.

36. The image processing apparatus according to Claim 28, wherein the above-described another image processing unit comprises at least one of a shading correcting unit, a low-pass filter processing unit, and an edge-emphasis processing unit.

37. An image processing apparatus for performing image processing including distortion correction processing and enlarging and reducing processing, of electronic image data obtained by capturing an image via an optical system, the image processing apparatus comprising a distortion correction processing unit, the distortion correction processing unit comprising:

an interpolating-coordinate generating unit that generates interpolating coordinate data, serving as coordinate data before interpolating processing, corresponding to the pixel position after the interpolating processing of the image processing including the distortion correction processing and the enlarging and reducing processing;

a memory unit that stores at least a part of the image data;

a memory control unit that controls the operation for partly writing the image data and the operation for reading the image data from the memory unit based on the

interpolating coordinate data; and

an interpolation calculating unit that calculates for interpolation the image data read from the memory unit under the control operation of the memory control unit to generate the image data at the pixel position after the interpolating processing.

38. The image processing apparatus according to Claim 37, wherein the interpolating-coordinate generating unit comprises:

an interpolating-position generating unit that generates an interpolating position, serving as coordinate data before the interpolating processing, corresponding to the pixel position after the interpolating processing associated with the image processing including the enlarging and reducing processing but not including the distortion correction processing and;

a distortion-correcting-coordinate converting unit that generates the interpolating coordinate data, serving as coordinate data before the interpolating processing, corresponding to the pixel position after the interpolating processing associated with the image processing including the distortion correction processing, by using the interpolating position generated by the interpolating-position generating unit; and

a selector that selects an output of the interpolating-position generating unit in the case that the distortion correction processing is not performed, selects an output of the distortion-correcting-coordinate converting unit in the case that the distortion correction processing is performed, and outputs the selected output to the memory control unit.

39. The image processing apparatus according to Claim 38, wherein the distortion-correcting-coordinate converting unit comprises:

a distortion-correcting-coefficient calculating unit that calculates a distortion correcting-coefficient, serving a coefficient indicating the change in coordinates due to the distortion aberration of the optical system; and

an interpolating-position correcting unit that corrects the interpolating position generated by the interpolating-position generating unit by using the distortion correcting coefficient calculated by the distortion-correcting-coefficient calculating unit to generate the interpolating coordinate data.

40. The image processing apparatus according to Claim 38, wherein the distortion correction processing unit operates by receiving a clock, and

the distortion-correcting-coordinate converting unit in

the distortion correction processing unit receives a clock different from a clock supplied to a part other than the distortion-correcting-coordinate converting unit in the distortion correction processing unit.

41. The image processing apparatus according to Claim 39, wherein the distortion correction processing unit operates by receiving a clock, and

the distortion-correcting-coordinate converting unit in the distortion correction processing unit receives a clock different from a clock supplied to a part other than the distortion-correcting-coordinate converting unit in the distortion correction processing unit.

42. The image processing apparatus according to Claim 38, wherein the distortion correction processing unit operates by receiving a clock, and

the interpolating-position generating unit, or the interpolating-position generating unit and the distortion-correcting-coordinate converting unit generate the interpolating position, or generate the interpolating position and generate the interpolating coordinate data at an interval of clocks, not every clock.

43. The image processing apparatus according to Claim

39, wherein the distortion correction processing unit operates by receiving a clock, and

the interpolating-position generating unit, or the interpolating-position generating unit and the distortion-correcting-coordinate converting unit generate the interpolating position, or generate the interpolating position and generate the interpolating coordinate data at an interval of clocks, not every clock.

44. The image processing apparatus according to Claim 40, wherein the distortion correction processing unit operates by receiving a clock, and

the interpolating-position generating unit, or the interpolating-position generating unit and the distortion-correcting-coordinate converting unit generate the interpolating position, or generate the interpolating position and generate the interpolating coordinate data at an interval of clocks, not every clock.

45. The image processing apparatus according to Claim 41, wherein the distortion correction processing unit operates by receiving a clock, and

the interpolating-position generating unit, or the interpolating-position generating unit and the distortion-correcting-coordinate converting unit generate the

interpolating position, or generate the interpolating position and generate the interpolating coordinate data at an interval of clocks, not every clock.

46. The image processing apparatus according to Claim 38, wherein the distortion-correcting coordinate converting unit generates the interpolating coordinate data based on a practical formula obtained by modifying a basic formula such that the number of multiplying times in the practical formula is fewer than that in the basic formula.

47. The image processing apparatus according to Claim 39, wherein the distortion-correcting coordinate converting unit generates the interpolating coordinate data based on a practical formula obtained by modifying a basic formula such that the number of multiplying times in the practical formula is fewer than that in the basic formula.

48. The image processing apparatus according to Claim 40, wherein the distortion-correcting coordinate converting unit generates the interpolating coordinate data based on a practical formula obtained by modifying a basic formula such that the number of multiplying times in the practical formula is fewer than that in the basic formula.

49. The image processing apparatus according to Claim 41, wherein the distortion-correcting coordinate converting unit generates the interpolating coordinate data based on a practical formula obtained by modifying a basic formula such that the number of multiplying times in the practical formula is fewer than that in the basic formula.

50. The image processing apparatus according to Claim 42, wherein the distortion-correcting coordinate converting unit generates the interpolating coordinate data based on a practical formula obtained by modifying a basic formula such that the number of multiplying times in the practical formula is fewer than that in the basic formula.

51. The image processing apparatus according to Claim 43, wherein the distortion-correcting coordinate converting unit generates the interpolating coordinate data based on a practical formula obtained by modifying a basic formula such that the number of multiplying times in the practical formula is fewer than that in the basic formula.

52. The image processing apparatus according to Claim 44, wherein the distortion-correcting coordinate converting unit generates the interpolating coordinate data based on a practical formula obtained by modifying a basic formula such

that the number of multiplying times in the practical formula is fewer than that in the basic formula.

53. The image processing apparatus according to Claim 45, wherein the distortion-correcting coordinate converting unit generates the interpolating coordinate data based on a practical formula obtained by modifying a basic formula such that the number of multiplying times in the practical formula is fewer than that in the basic formula.

54. The image processing apparatus according to Claim 39, wherein the distortion-correcting-coefficient calculating unit calculates the distortion correcting coefficient based on the distance between the center of distortion and the position corresponding to the target pixel in the image after correcting the distortion, and performs at least a part of the calculation processing by the calculation using a floating decimal.

55. The image processing apparatus according to Claim 54, wherein the distortion-correcting-coefficient calculating unit comprises a look-up table for storing a corresponding relationship between the square of the distance and the distortion correcting coefficient, and obtains the square of the distance by the calculation

using a floating decimal, and calculates the distortion correcting coefficient by referring to the look-up table based on the obtained square of the distance.

56. An image processing apparatus for processing electronic image data obtained by capturing an image via an optical system, the image data comprising a plurality of components, the image processing apparatus comprising a distortion correction processing unit, the distortion correction processing unit comprising:

a distortion-correcting-coefficient calculating unit that calculates, every component, a distortion correcting coefficient used for correcting the distortion aberration due to the optical system based on the distance from the center of distortion; and

a distortion-correction calculating unit that corrects the distortion of the image data every component by using the distortion correcting coefficient every component calculated by the distortion-correcting-coefficient calculating unit.

57. The image processing apparatus according to Claim 56, wherein the distortion-correction calculating unit comprises a plurality of the distortion-correction calculating units that are arranged with a one-to-one

corresponding relation of all components forming the image data.

58. The image processing apparatus according to Claim 57, wherein the distortion correction calculating unit comprises an inner buffer that stores the image data, and outputs a starting request of the distortion correction processing when the image data necessary for the distortion correction processing is stored in the inner buffer, and

the distortion correction calculating unit further comprises a grant synchronizing unit that controls the operation such that the distortion correction processing starts for all of the plurality of distortion correction calculating units after collecting the starting requests of the distortion correction processing from all the distortion correction calculating units.

59. The image processing apparatus according to Claim 58, wherein the grant synchronizing unit controls the operation such that all the distortion correction calculating units start the distortion correction processing by outputting a grant signal for granting calculating processing of the distortion correcting coefficient to the distortion-correcting-coefficient calculating unit and by starting the calculation of the distortion correcting

coefficients for all components of the distortion-correcting-coefficient calculating units.

60. The image processing apparatus according to Claim 56, wherein the distortion-correcting-coefficient calculating unit has at least one part that is commonly used for all components upon calculating the distortion correcting coefficient every component.

61. The image processing apparatus according to Claim 57, wherein the distortion-correcting-coefficient calculating unit has at least one part that is commonly used for all components upon calculating the distortion correcting coefficient every component.

62. The image processing apparatus according to Claim 58, wherein the distortion-correcting-coefficient calculating unit has at least one part that is commonly used for all components upon calculating the distortion correcting coefficient every component.

63. The image processing apparatus according to Claim 59, wherein the distortion-correcting-coefficient calculating unit has at least one part that is commonly used for all components upon calculating the distortion

correcting coefficient every component.

64. The image processing apparatus according to Claim 60, wherein the distortion-correcting-coefficient calculating unit calculates the square of the distance from the center of distortion, and obtains the distortion correcting coefficient every component based on the square of the distance, and

the portion commonly-used for all components calculates the square of the distance from the center of distortion.

65. The image processing apparatus according to Claim 61, wherein the distortion-correcting-coefficient calculating unit calculates the square of the distance from the center of distortion, and obtains the distortion correcting coefficient every component based on the square of the distance, and

the portion commonly-used for all components calculates the square of the distance from the center of distortion.

66. The image processing apparatus according to Claim 62, wherein the distortion-correcting-coefficient calculating unit calculates the square of the distance from the center of distortion, and obtains the distortion correcting coefficient every component based on the square

of the distance, and

the portion commonly-used for all components calculates the square of the distance from the center of distortion.

67. The image processing apparatus according to Claim 63, wherein the distortion-correcting-coefficient calculating unit calculates the square of the distance from the center of distortion, and obtains the distortion correcting coefficient every component based on the square of the distance, and

the portion commonly-used for all components calculates the square of the distance from the center of distortion.

68. The image processing apparatus according to Claim 64, wherein the distortion-correcting-coefficient calculating unit comprises, for each of the components, a look-up table that stores a corresponding relationship between the square of the distance from the center of distortion and the distortion correcting coefficient, and

obtains, every component, the distortion correcting coefficient based on the calculated square of the distance by referring to the look-up table for each of the components.

69. The image processing apparatus according to Claim 65, wherein the distortion-correcting-coefficient

calculating unit comprises, for each of the components, a look-up table that stores a corresponding relationship between the square of the distance from the center of distortion and the distortion correcting coefficient, and obtains, every component, the distortion correcting coefficient based on the calculated square of the distance by referring to the look-up table for each of the components.

70. The image processing apparatus according to Claim 66, wherein the distortion-correcting-coefficient calculating unit comprises, for each of the components, a look-up table that stores a corresponding relationship between the square of the distance from the center of distortion and the distortion correcting coefficient, and obtains, every component, the distortion correcting coefficient based on the calculated square of the distance by referring to the look-up table for each of the components.

71. The image processing apparatus according to Claim 67, wherein the distortion-correcting-coefficient calculating unit comprises, for each of the components, a look-up table that stores a corresponding relationship between the square of the distance from the center of distortion and the distortion correcting coefficient, and obtains, every component, the distortion correcting

coefficient based on the calculated square of the distance by referring to the look-up table for each of the components.